FISSIMENTUM, A NEW GENUS OF DROUGHT-TOLERANT CHIRONOMINI (DIPTERA: CHIRONOMIDAE) FROM THE AMERICAS AND AUSTRALIA[1]

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ABSTRACT: The genus *Fissimentum* is described from all life history stages for a previously recognized but unreared larval taxon "Tendipedini genus A" of Roback, 1966. A Neotropical species *Fissimentum desiccatum*, here described for Roback's (1966) species 4, shows drought tolerance in Brazil. Unreared larvae from Brazil and Australia allocated to genus *Fissimentum* are discussed in relation to the type species.

Identification of chironomid larvae often is hampered by incomplete knowledge of the full life history (Epler and Ferrington, 1994). This arises from an historical legacy of species descriptions based on the adult male, which has deterred most taxonomists from naming taxa solely on the immature stages because of the risk of unintentional creation of synonymy with previously described but unreared adults. However, locating and rearing particular larvae to obtain the complete life history for description may be slow. For example, it took nearly half a century between the description of *Paratendipes basidens* Townes and the discovery of its distinctive larva (Epler and Ferrington, 1994) and some thirty years for the equally characteristic *Stelechomyia* to be fully associated (Reiss, 1982).

Among the distinctive larval forms which have remained unreared for a protracted period is a group of Chironomini that have curious medially cleft menta. First reported from the southern USA and the neotropics by Roback (1966) as "Tendipedini genus A," this taxon encompassed the larvae of four species and one variety. By the time of the compilation of the keys and diagnoses for the Holarctic Chironominae (Pinder and Reiss, 1983), the still-unreared taxon (there referred to as "Chironomini genus A Roback") was known to occur in marginal sediments of slowly-flowing, tropical, lowland rivers of South America, Florida and Texas.

In 1993, the junior author found a distinctive larva of this group to be common in potamal benthic habitats of the Rio Bento Gomes, a white water river in the Brazilian state of Mato Grosso. Using both individual and mass techniques, pupae and adults of both sexes were reared and found to belong to no formally described taxon. In this and contemporary studies elsewhere in Brazil a second of Roback's species was found. Meanwhile in Australia larvae apparently belonging also to "Chironomini genus A Roback" were discovered in a dystrophic subtropical perched lake and among an earlier survey collection from the marginal sediments of a temperate river.

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In this contribution we describe the genus as new, bestowing the name *Fissimentum* based on the distinctive cleft larval mentum. We describe and illustrate the pupa and both sexes of adult, redescribe and illustrate the larvae, examine the phylogenetic position and discuss the ecology, including the larval desiccation tolerance.

MATERIALS AND METHODS

Larvae were collected by conventional nets and reared in the laboratory (by Nolte) in petri dishes filled with mud and water from the river and maintained at ambient temperature (27-32°C). Associated material was preserved in 75% ethanol. Australian material either died in attempted rearing or was preserved directly on collecting. Microscope slide preparation (Cranston) involved clearing where necessary with 10% KOH, neutralization and initiation of dehydration with glacial acetic acid, then mounting from propan-2-ol (isopropanol) into Euparal.

Morphological terminology follows Sæther (1980) except where we adopt Langton's (1994) suggested use of taenia (adjective taeniate) for "filamentous" or "lamelliform" (LS) pupal setae.

All measurements in μm unless stated otherwise.

Fissimentum NEW GENUS

Fissimentum Cranston and Nolte, gen. nov.
"Tendipedini Genus A" Roback 1966: 325
"Chironomini Genus A Roback"; Pinder & Reiss, 1983: 349; Epler, 1992: 7.116

Type species: *Fissimentum desiccatum* Cranston and Nolte, sp. nov., by present designation.

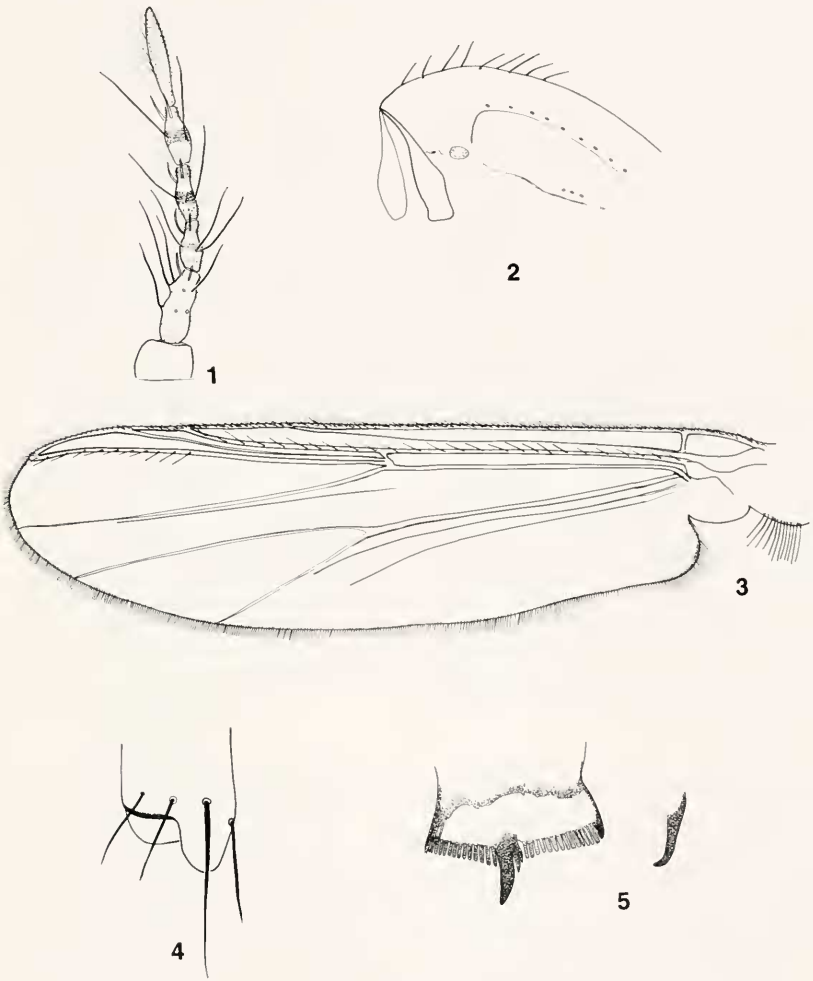
Etymology: from L. *fissus* cleft, past participle of *findere* - to split and NL. *mentum*, the median toothed plate. Neuter noun.

Generic diagnosis

Adult. Medium-sized species, with body length to 5mm, wing length to 2.5mm. Wing unpatterned; thorax brown with darker vittae and postnotum; legs dark brown with yellower basitarsomeres.

Antenna. Male with 13 flagellomeres, antennal ratio (AR) c. 1.7. Female with 5 flagellomeres (Fig. 1), AR c. 0.4.

Head. Eye bare, with bluntly wedge-shaped dorsomedial parallel-sided extension about 6 ommatidia long; in both sexes eyes separated medially by about width of 4-5 ommatidia. Temporal setae of uni-biserial postorbitals merging into verticals; clypeals present. Frontal tubercles absent. Palp 5 segmented, segment 2 globular, segment 4 shorter than 3 and 5; segment 3 with or without 1 sensilla.



Figures 1-5. *Fissimentum desiccatum* n. gen. n. sp. adult. 1. Female antenna. 2. Male thorax. 3. Male wing. 4. Apex of anterior tibia. 5. Apex of hind tibia and spur of hind tibial comb in lateral view.

Thorax (Fig. 2). Antepronotal lobes tapering dorsally, medially narrowly separated. Scutum not overreaching antepronotum; profile of scutum gently rounded, tubercle lacking. Acrostichals biserial running from anterior thorax to mid-scutum; dorsocentrals, prealars and scutellars uniserial.

Wing (Fig. 3). Membrane without setae, with moderate to strong microtrichiation ('punctation'). Anal lobe rounded. Costa ending abruptly at apex of R_{4+5}, somewhat proximal to wing apex; R_{2+3} running midway between but ending in proximal $^1/_4$ between R_1 and R_{4+5}. FCu slightly distal to RM. R, R_1 and R_{4+5} setose in both sexes. Squama setose.

Leg. Apex of fore tibia with rounded scale, without spur (Fig. 4). Mid and hind tibiae apically with two nearly fused combs (Fig. 5) occupying two-thirds circumference of tibial apex, inner comb without spur, outer (longer) comb with short, curved spur (Fig. 5). Fore leg ratio > 2.0. Pulvilli absent. Sensilla chaetica absent. Beard absent.

Abdomen. Tergites I - VII with irregularly scattered setae.

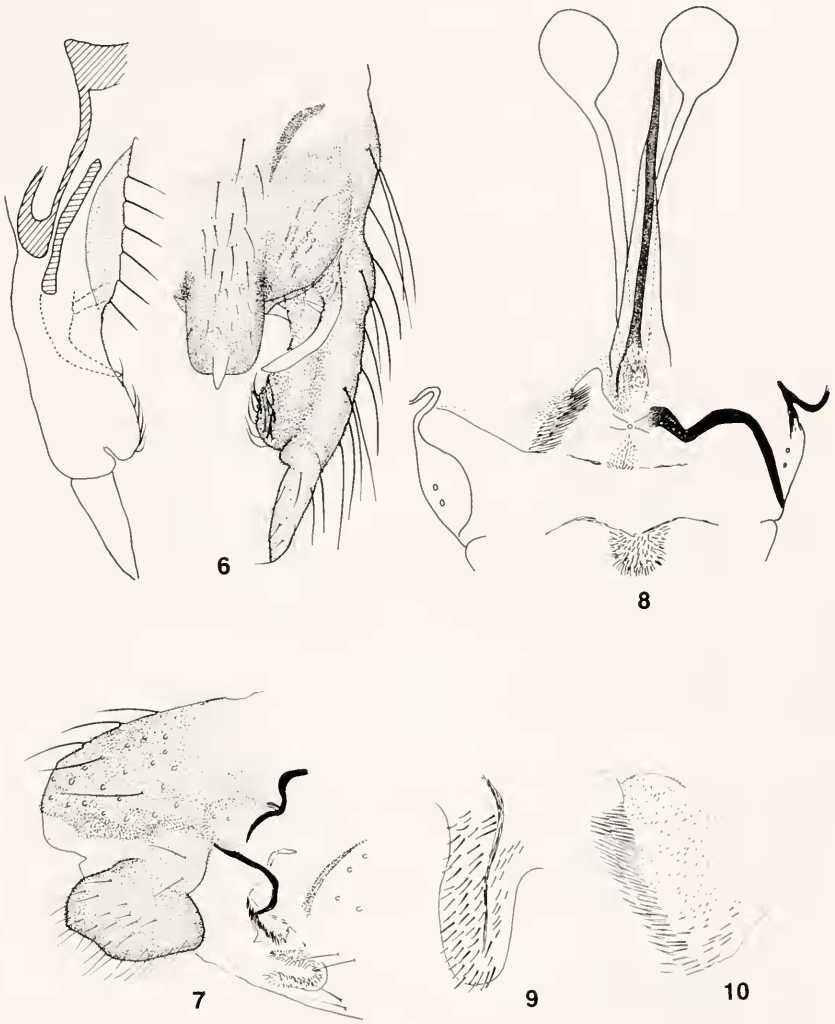
Hypopygium (Fig. 6). Anal tergite bands weak, delimiting median anal tergite setae that intergrade into shorter, finer apical setae. Anal point short, tapering to blunt apex, arising from elevated projecting tergal extension. Superior volsella slightly swollen basally and microtrichiose/setose, with curved digitiform extension, without microtrichia, with 2 medially directed setae on inner margin. Median volsella absent. Inferior volsella fused to full length of gonocoxite, extending to apex of gonocoxite; microtrichiose with medially and dorsomedially directed, simple setae, without differentiated posteriorly directed strong seta. Gonostylus bulbous at base, straight, ending bluntly. Sternapodeme bluntly pointed apicomedially, without oral projections. Phallapodeme elongate, narrow.

Female genitalia (Figs. 7-10). Notum long and thin, with long, broadened rami. Gonocoxapodeme almost straight, not fused medially. Coxosternapodeme IX weakly sclerotised and gently curved. Dorsomesal lobe of gonapophysis VIII (Fig. 9) elongate, continuous with inner contour of vagina, microtrichiose except hyaline apico-medially. Ventrolateral lobe distinct, darkened, rectangular, as large as dorsomesal lobe (Fig. 10), lying lateral to, and not covering, dorsomesal lobe, microtrichiose basally, with long pointed scales apico-medially. Apodeme lobe more or less rectangular, variably sclerotised, lying dorsal to dorsomesal lobe. Labia hyaline, with microtrichia (Fig. 8). Gonocoxite IX small, not laterally extended, with 1-2 setae. Tergite IX large, undivided. Postgenital plate large, microtrichiose. Seminal capsules oval, darkened near very short neck; seminal ducts straight and ending separately. Cerci relatively small, elongate-quadrate (Fig. 7).

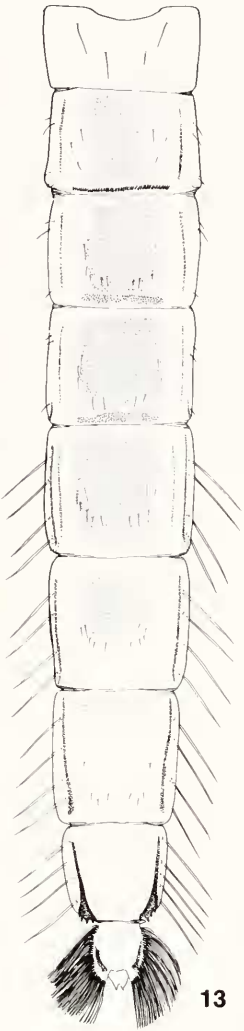
Pupa. Medium-sized, up to 6.5mm long, red colored. Cephalothorax pale to mid-brown, anterior abdominal segments very pale brown, posterior abdomen pale with darker brown apophyses, comb and anal lobe.

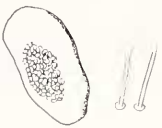
Cephalothorax. Cephalic area without tubercles, frontal warts or frontal setae. Thorax (Fig. 11) with 1 median, 1 lateral taeniate antepronotal seta; 2 stout taeniate precorneals; dorsocentral (dc) 2 midway between dc_1, and the more approximated dc_3 and dc_4, all subequal and rather stoutly taeniate. Thoracic horn very plumose; basal ring (Fig. 12) well developed, oval, with 1 elongate-oval tracheal bundle. Median suture smooth except few scales in mid-thorax. Prealar tubercle absent.

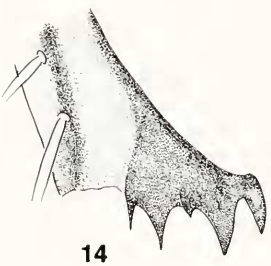
Abdomen (Fig. 13). Tergite I bare, II-VII with subquadrate area of spinules, VII with anterior transverse band, VIII with antero-lateral fine spinule area. Anal segment bare. Tergite II hook row continuous, 60% tergite width, comprising c. 50-60 hooks. Conjunctives III/IV and IV/V with fine anterior directed spines/spinules. All sternites with at least anterior transverse band of spinules, most strongly developed and extending posterolaterally on I and II. Pedes spurii A present on sternite IV, weak or absent on V and VI; pedes spurii B weak. Posterolateral corner of segment VIII dark, few stout golden-brown teeth (Fig. 14). Apophyses strong.



Figures 6-10. *Fissimentum desiccatum* n. gen. n. sp. genitalia. 6. Male, left side ventral, right side dorsal. 7. Female, lateral. 8. Female, ventral. 9. Dorsomesal lobe of gonapophysis VIII. 10. Ventrolateral lobe of gonapophysis VIII.







Figures 11-14. *Fissimentum desiccatum* n. gen. n. sp. pupa. 11. Thorax, lateral. 12. Base of thoracic horn. 13. Abdominal tergites. 14. Posterolateral corner of sternite VIII.

Setation. Segment I with 2D, IV and without L setae; II-VII with 5D, 2-3V; 3L on II-IV, V-VII with 4L taeniate setae, VIII with 0D, 2V, 5 taeniate L setae. 1 pair of 0 setae on tergites and sternites II - VII.

Anal lobe rather elongate, with fringe of 50+ uniserially inserted taeniate setae, setal bases darkened. Dorsal taeniate seta small. Genital sac of male reaching just beyond apex of anal lobes, female genital sac shorter than anal lobes.

4th instar Larva. Medium sized, up to 9mm long, with ventral head length up to 650 µm, red colored, with dark occipital margin and "collar" lying anterior to lateral occipital margin, giving impression of doubled margin (Figs. 15-16).

Dorsal surface of head (Fig. 17). Frontal apotome broad, without frontal pit; labral sclerite 1 and 4 disrupted, 2 and 3 complete.

Antenna (Figs. 18, 27, 28). Six segmented, either with short 4th segment or with each successive segment shorter than the preceding. Lauterborn organs small to moderately well developed and alternate on apices of 2nd and 3rd segments. Segment 3 with subapically inserted fine style or style absent. Ring organ in apical third of segment 1, seta absent. Blade extending beyond antenna apex.

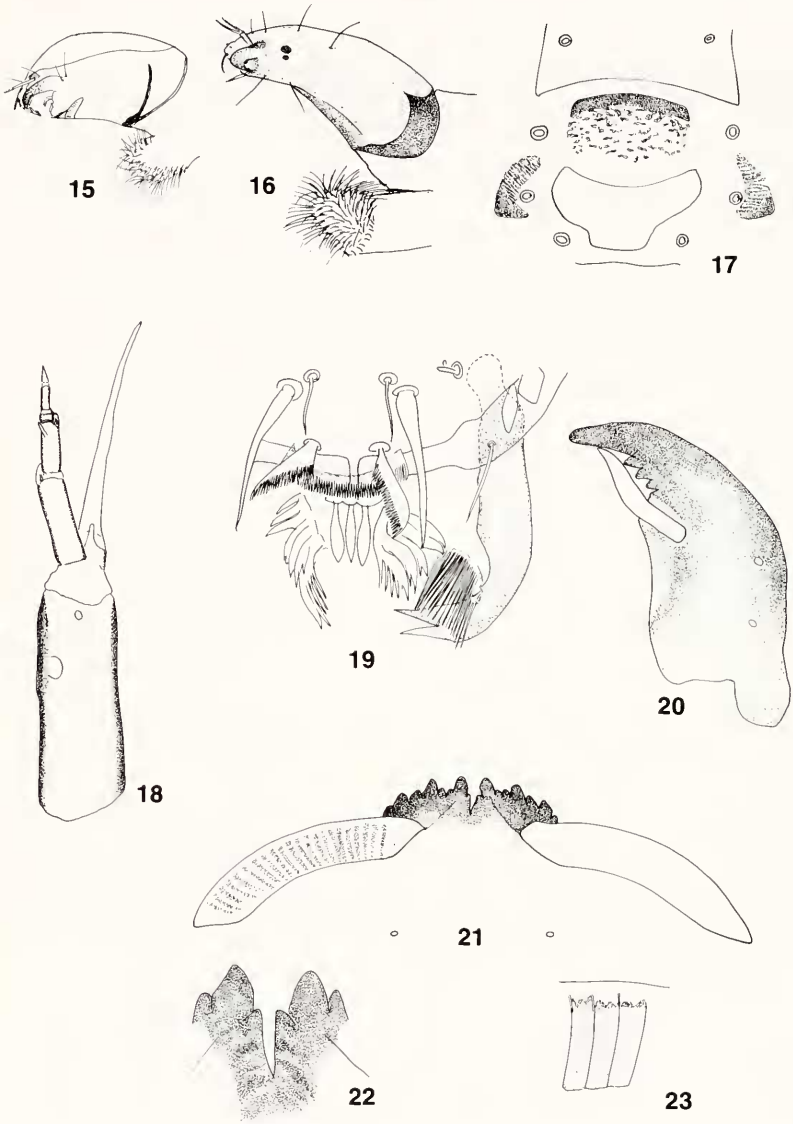
Labrum (Figs. 19, 32). SI plumose, with branching strongest on inner margin; SII long, curved simple; SIII simple, short; SIVa small, SIVb strongly developed. Chaetae developed as 2 broad scales. Seta praemandibularis strong and simple. Labral lamellae broad, with slight indication of median division. Pecten epipharyngis of three separate scales, either simple, narrow, elongate and pointed or 3-4 toothed in a single plane. Chaetulae short, triangular or with 4-5 inner teeth; chaetulae basales weak. Premandible with 2 pointed teeth and strong brush.

Mandible (Figs. 20, 29-31). Dorsal tooth absent (in one species perhaps represented by medio-dorsal hooked tooth [Fig. 31]); strong apical tooth and 3 small inner teeth. Pecten mandibularis absent. Seta subdentalis broad, sinuous, variably extended up to length of apical tooth. Mola and inner margin smooth. Seta interna absent.

Mentum (Figs. 21-26). With distinct cleft in mid-mentum, with cleft including either paired small teeth, fine serrations or smooth inner surface. Cleft and median teeth combined forming ventromentum faintly demarcated by antero-median extension of ventromental plate, dorsomentum of six teeth on each side, variously organized, sometimes directed antero-medially; all teeth brown. Ventromental plates separated medially by > 50% of mentum width, elongate with smooth margin, with striae either of regularly spaced broad lappets without anterior hooks or spines (Fig. 23) or variably reduced (Fig. 26). Setae submenti very long, simple.

Maxilla broad, with exceptionally long maxillary palp.

Abdomen. Lateral and ventral tubules absent. Anterior parapods with dense, fine claws, some of which may be finely serrate apically; posterior parapod claws simple, some broad-based, with or without basal fine spinules. Procercus weakly pigmented, small, as wide as high, bearing 6-7 subequal anal setae. Supraanal setae as long as anal setae, procercal seta elongate, half length of anal and supraanal setae. Four unconstricted anal tubules.



Figures 15-23. *Fissimentum* n. gen. n. sp. larva. Lateral head of 15. *F. desiccatum*. 16. *F.* sp. 2. *F. desiccatum*: 17. Dorsal head. 18. Antenna. 19. Labrum. 20. Mandible. 21. Mentum and ventromental plates. 22. Median mentum, 23. Detail of striae.

Fissimentum desiccatum NEW SPECIES

Genus A sp. 4 Roback 1966: 326.

Etymology: from L. *desiccare*, to dry up, referring to the desiccation tolerance of this species.

Male adult (n=3). Body length 4.7-5.4mm, wing length 1.7-2.0 mm. Brown, with apical $^2/_3$ of tarsomere 1 pale.

Head. With 13-18 uniserial temporal setae, 15-20 clypeals. Antenna with apical flagellomere 740-890 long, basal 12 flagellomeres 400-445 long, AR 1.73-2.00, palp segment 2-5 lengths: 38-45, 175-195, 145-160, 205-265.

Thorax. Setation: acrostichals 10-16, biserial, dorsocentrals 8-11, uniserial, 3 prealars, 7-8 scutellars.

Wing with VR 1.05-1-07. Vein setation: R with 16-21, R_1 8-13, R_{4+5} 12-13; squama with 12-13.

Leg lengths and proportions:

	Fe	Ti	Ta1	Ta2	Ta3	Ta4
PI	845-935	450-540	1190-1405	865-900	575-610	470-520
PII	785-900	685-790	515- 540	230-258	160-186	105-115
PIII	755-865	755-880	715- 845	355-420	265-320	150-185

	Ta5	LR	BV	SV	BR
PI	215-250	2.34-2.60	1.2-1.3	1.1-1.2	0.8-1.2
PII	90-100	0.67-0.68	3.4-3.6	3.1	1.4-2.0
PIII	105-130	0.94-0.96	2.4-2.5	2.1	1.8-2.2

Sensilla chaetica absent.

Hypopygium (Fig. 6). Dorsal tergite IX setae 12-17, bounded laterally by weak tergal bands, 11-14 finer setae on ventral surface of tergite IX. Gonocoxite 220-235 long, gonostylus 80-105 long.

Adult female (n = 4). Body length 4.3-5.4 mm, wing length 1.9-2.3 mm, color as male.

Head. With 13-15 biserial temporal setae, 23-27 clypeals. Antenna with apical flagellomere 126-151 long, basal 4 flagellomeres 330-355 long, AR 0.38-0.42. Palp segment 2-5 lengths: 45-50, 175-185, 170-185, 265-320.

Thorax. Setation: acrostichals 18-20, biserial, dorsocentrals 15-18, uniserial, 3 prealars, 8-9 scutellars. Wing with VR 1.08-1.12; setation: R with 20-23, R_1 16-23, R_{4+5} 26-28, squama with 11-23.

Leg lengths and proportions as follows:

	Fe	Ti	Ta1	Ta2	Ta3	Ta4
PI	880-980	545-620	1260-1350	900-910	590-610	505-520
PII	870-970	790-880	535- 580	230-250	160-170	105-125
PIII	820-900	855-955	755- 790	355-395	285-325	180-190

	Ta5	LR	BV	SV	BR
PI	215-240	2.3 -2.4	1.2-1.3	1.1-1.2	0.7-1.1
PII	80-105	0.65-0.69	3.7-3.9	3.1-3.2	1.3-1.5
PIII	125-145	0.83-0.91	2.4-2.7	2.2-2.3	1.9-2.3

Sensilla chaetica absent.
Genitalia. As in Figs. 7-10.

Pupa (n = 4) (Figs. 11-14). Body length 5.9-7.2mm. Pale with darker apophyses on more posterior abdominal segments. Distance from dc_1 - dc_2 88-94, dc_2-dc_3 115-122, dc_3-dc_4 28-38. Hook row on tergite II with 47-55 hooks, occupying 56-60% of the segment width. Anal lobe with 36-40 taeniate setae.

4th instar larva (n = 5) (Figs. 17-23). Body length 5.7-9.5mm, deep red pigmented; head capsule length 430-480, pale yellow with brown mentum, pale brown mandible, with characteristically doubled pale occipital margin.
Antennal segment lengths, 53-58, 18-22, 10-12, 1-2, 5-6, 3-4; AR 1.20-1.34; alternate Lauterborn organs 1-2 long; blade length 46-50; style length 10-12.
Mandible length 150-162. Mentum width 88-98, ventromental plate width 140-152. Premandible length 56-66.

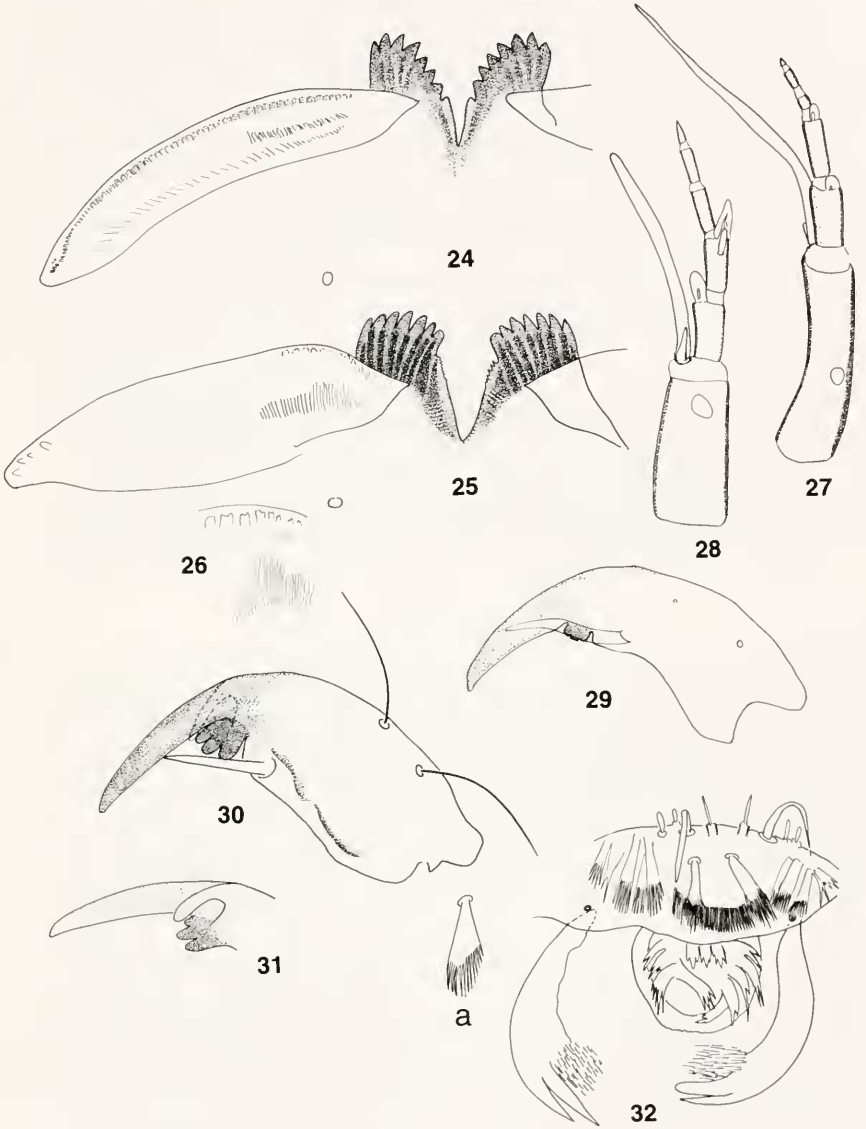
Material examined. HOLOTYPE: male, Brazil, Mato Grosso, Rio Bento Gomes, 16°20'S 56°32'W, 110m a.s.l., 17.viii. 1994, U. Nolte; deposited in the Entomological Collection of the Federal University of Cuiabá, Mato Grosso, Brazil (UFMT). PARATYPES, 2 males, 4 females, 4 Pe, 11 larvae, same data as holotype, 1f, 1Pe, 1L in The Natural History Museum, London (BMNH), 1m, 1f, 1Pe, 1L, deposited in Zoologische Staatsammlung München, Germany (ZSM), remainder in Australian National Insect Collection, Canberra (ANIC).

Larval taxa

The following two larval taxa share the cleft mentum with *F. desiccatum*, but differ from the genotype in the pecten epipharyngis scales, which in both taxa are toothed rather than elongate and simple, and the reduction of the ventromental plate striae. However, features of the labrum, the very extended maxillary palp and the mandible shape are all shared, apparently derived features that suggest homology of the cleft mentum, rather than convergence.

Fissimentum sp.2
Tendipedini Genus A species 2 Roback 1966: 326.

4th instar larva (n = 5). Body length 8-9 mm. Head capsule length 620-660, golden to pale-brown with brown mentum, golden to pale brown mandible, with broad brown "collar" (wide



Figures 24-32. *Fissimentum* n. gen., undescribed larvae. Menta of: 24. *F.* "sp. 2". 25. *F.* sp. "Australia". 26. Detail of striae of *F.* sp. "Australia". Antenna of: 27. *F.* sp. "2". 28. *F.* sp. "Australia". Mandible of: 29. *F.* sp. "2". 30. *F.* sp. "Australia". 31 detail of mandible of *F.* sp. "Australia". 32. Labrum of *F.* sp. "Australia", a. detail of S1 seta.

occipital margin). Antenna (Fig. 27) segment lengths, 55-62, 18-20, 18-20, 4-5, 6- 7, 2-3, AR 1.06-1.18; alternate Lauterborn organs 4-5 long; blade length 80-88; style not visible. Mandible (Fig. 29) length 215-225. Mentum (Fig. 24) width 90-110, ventromental plate width 190-230. Labrum with premandible length 84-88.

Material examined. 5L, BRAZIL, Sao Paulo, Sao Carlos, Faz. Cauchim. 22°02S 47°53W, 1993, S. Strixino (1 to UFMT, 3 to ANIC). 5L, BRAZIL, Sao Paulo, Itarapina, Respresa do Lobo, 1979, S. Strixino (1 to Zoologische Staatsammlung München, 4 to ANIC).

Fissimentum sp. "Australia"

4th instar larva (n=1). Body length unknown (only head capsule retained). Head capsule length 350, pale yellow with brown mentum, pale brown mandible, with doubled occipital margin somewhat darker.

Antenna (Fig. 28) segment lengths, 32, 15, 10, 10, 7, 5; AR 0.68; alternate Lauterborn organs 3-4 long; blade length 56; style 8.

Mandible (Fig. 30) length 106, with strongly developed hooked tooth on dorsal surface (Fig. 31). Mentum (Fig. 25) width 63, ventromental plate width 135. Labrum (Fig. 32) with premandible length 43.

3rd instar larva (n = 2). Body length unknown. Head capsule 260. Antennal segment lengths 18, 11, 9, 7, 6, 4, AR c. 0.5, blade 45. Mandible 68. Mentum width 43, ventromental plate width 77. Premandible 27.

Material examined. 2L (1 4th instar, 1 3rd instar), AUSTRALIA, Victoria, Lower Woori Yallock, nr Healesville, Yarra River, "YRS 103," 37°46'S 145°31'E, 6.xii.1985, V. Pettigrove (1 to ANIC, 1 to Water Ecoscience, Mt. Waverley, Melbourne, Victoria.), 1L (3rd instar), AUSTRALIA, Queensland, Fraser Island, Lake Boomanjin, 24°03'S 153°05'E, P. S. Cranston (ANIC).

DISTRIBUTION AND ECOLOGY

The most northerly records of *Fissimentum* are from coastal plain drainages in southern USA: Lake Murray, S. Carolina (34°N) (Hudson *et al.*, 1990), the Guadalupe River, Texas (29°N) (Roback 1966) and the Suwannee River, Florida (29°-30°N) (Epler, 1992). The genus occurs in Central America (Costa Rica, Epler, 1992), Puerto Rico (L. Ferrington pers. comm.), Peruvian rivers in the foothills of the Andes (6°S, 11°S, Roback, 1966) and as far south as 30°S in the coastal plains of Rio Grande do Sul, Brazil (Wiedenbrüg, 1993). In Australia, the two records of the genus span a range from 24° to 37°S.

In the Rio Bento Gomes, a Brazilian intermittent tropical lowland river, the larvae of *Fissimentum desiccatum* live in the potamal zone. In the studied 6th order stretch, the bed width is 50-60m, and maximum depth 3.5m (except in flood when the river leaves its bed). The discharge is highly dynamic, with 80% of the annual rainfall falling between November and April. With no rainfall from June to August, sometimes May to September, flow ceases even in the potamal and some drying down takes place. Areas of low current velocity support extensive floating macrophyte beds. During the study period, the temperature mean was 28°C (range 21°-31°C), pH mean 6.8 (5.6-7.3), conductivity 80 $\mu S.cm^{-1}$ (30-130 $\mu S.cm^{-1}$).

The larvae of *Fissimentum desiccatum* live in soft, muddy sediments including those which include some fine sand but they are not found in pure clay and silt. These sediments may be visibly organically enriched with decomposing macrophytes or litter from the riparian forest, or may contain little visible organics. Observations through several seasons showed that microhabitat preference is for the texture of mud, fine sand and detritus, which is prevalent in the dry season when water levels decrease and lentic conditions prevail. Depths range from the littoral (Roback, 1966) to mid-river at 3m. With a maximum density of 4,570 larvae per m^2, *F. desiccatum* may be either the dominant benthic chironomid or share dominance with *Polypedilum* spp.

The two Australian sites are superficially rather dissimilar: on Fraser Island, Lake Boomanjin is one of the largest perched (elevated above the water table) lakes in the world, with highly dystrophic, claret-colored water of low conductivity (95 $\mu S.cm^{-1}$) and low pH (3.5-3.6). The second site, from which a series of larvae was collected, is lightly colored, gently flowing, about 12-15m wide and several metres deep, in a Yarra River pool disturbed by swimmers in the summer. However, in both locations the Australian larvae occurred at depths of approximately 1 metre in a fine organic film overlying coarser substrates (Pettigrove, 1988).

DESICCATION

Larvae of *Fissimentum desiccatum* typically burrow into the sediments, where flimsy silk galleries are formed. When these sediments are dried in the laboratory until cracks form, larval *F. desiccatum* tolerate desiccation and revive when rehydrated. This ability seems to be related to the distinctive, cellophane-like, unwettable larval cuticle. In further testing of this phenomenon (by Nolte), larvae were placed in water-filled petri dishes containing 5-7mm of sediment which were allowed to dry. The duration of exposure to desiccation was calculated from the time of loss of visible free water to the time of refilling of the petri dish with water. In the first trial, following three days of dry conditions, pupation and subsequent successful female emergence took place within 36h of rehydration. In a second trial involving several successive desiccations and rehydrations, an initial drying of three larvae for 11h was followed by completely successful overnight rehydration. These revived larvae were then subjected to different treatments: one was completely dried for 2d - upon rehydration, pupation and the female adult emergence took place within 16h; the two remaining larvae were dried for 36h, rehydrated for 10h, desiccated again for 3d - upon rehydration, pupation and male adult emergence took place within 19h.

Studies of *Polypedilum vanderplancki* Hinton have allowed good understanding of desiccation in larval Chironomidae (Hinton, 1951, 1960a, b). However, this spectacular example of cryptobiosis (loss of all body water and cessation of metabolism) probably is unique and is not repeated in other desiccation-tolerant chironomids. In most other species studied, larval cocoon

formation is the prevailing mode of survival of drying (Jones, 1975; Grodhaus, 1980; Pinder, 1994). On the evidence available, *Fissimentum desiccatum* does not form a cocoon but may limit water loss through a less permeable cuticle.

SYSTEMATICS

In the Holarctic keys to adult males (Cranston *et al.*, 1989) *Fissimentum* keys with some difficulty into genera close to *Tribelos*, differing particularly in the absence of pulvilli. When Holarctic genera with adults lacking pulvilli are considered, then *Apedilum* and *Paralauterborniella* enter into consideration, but both these genera lack squamal setae and have the fore tibial spur truncate. Never the less, these genera share some larval features with *Fissimentum*, notably the six segmented antennae bearing alternate Lauterborn organs. Looking more widely for resemblance among Chironomini, *Fissimentum* keys in Sæther (1977) to the Australian endemic monotypic genus *Paraborniella*, which lacks pulvilli, has a single spur on comb, and a larva that belongs in the 6 segmented grouping, but the fore tibial spur of this taxon is very flat, and the female genitalia differ strongly. Ignoring the absence of pulvilli, *Polypedilum* is a candidate, but this is refuted by the immature stages, both pupa and larva.

Features of the pupa are predominantly uninformative of relationships, with those few Holarctic Chironomini taxa that lack frontal setae (such as *Robackia*) eliminated on other grounds.

In view of this uncertainty, data matrices comprising character states scored from all life history stages of 50 genera of Chironomini have been combined and analyzed using the criterion of parsimony, following the rationale of Cranston (1994), with *Pseudochironomus* and *Riethia* (Pseudochironomini) chosen as outgroups. The results show *Fissimentum* postulated to be the sister group to *Imparipecten* Freeman, a taxon whose full description is in press (Cranston and Hardwick, 1996). These two are closely related to *Conochironomus* Freeman (Cranston and Hare, 1995) and *Skusella* Freeman and more distantly to the genera centered on *Stictochironomus* and *Paratendipes*. This monophyletic generic grouping is supported almost entirely by the six-segmented larval antenna, with all supportive characters from the pupa and adults being highly homoplasious. Provisionally this placement is accepted, pending incorporation of further taxa from the six-segmented larval antenna group, thereby allowing phylogenetic analysis with species treated as terminals (rather than a *priori* determined genera, as at present).

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